Cardiovascular risk among nursing workers: a cross-sectional study

Risco cardiovascular entre trabalhadores de enfermagem: estudo seccional

Riesgo cardiovascular entre trabajadores de enfermería: estudio transversal

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ABSTRACT
Objective: to assess cardiovascular risk among nursing workers at a public hospital. **Method:** a cross-sectional study, with 324 nursing workers, using a questionnaire composed of two information blocks. The first covered issues related to sociodemographic and occupational and health characteristics, and the second, the Revised Framingham Risk Score (FRS), to stratify cardiovascular risk. To assess work-related psychosocial stress, the Swedish Social Control Demand Scale was used. **Results:** the most prevalent modifiable risk factor for CVDs was waist circumference (75.9%), followed by overweight (43.8%), obesity (29.3%), alcohol consumption (21.9%), lipoprotein cholesterol low density (LDL) > 130 (20.7%) and hypertension (20.4%) **Conclusion:** it was found that 96% of workers had a low risk of developing cardiovascular disease in the next ten years, and male workers aged >40 years with shorter working hours are more likely to have cardiovascular disease.
Descriptors: Cardiovascular Diseases; Risk Factors; Community Health Nursing; Occupational Health Nursing; Occupational Health.

RESUMO
Objetivo: avaliar o risco cardiovascular entre trabalhadores de enfermagem de um hospital público. **Método:** estudo seccional, com 324 trabalhadores de enfermagem, utilizando-se questionário composto por dois blocos de informações. O primeiro abrangeu questões relacionadas às características sociodemográficas e laborais, de saúde, e o segundo, o Escore de Risco de Framingham Revisado (ERF), para estratificar o risco cardiovascular. Para avaliar o estresse psicossocial no trabalho, utilizou-se a Escala Sueca de Demanda Controle Social. **Resultados:** o fator de risco modificável para DCVs mais prevalente foi a circunferência de cintura (75,9%), seguida de sobrepeso (43,8%), obesidade (29,3%), etilismo (21,9%), colesterol da lipoproteína de densidade baixa (LDL) > 130 (20,7%) e Hipertensão Arterial Sistêmica (20,4%). **Conclusão:** verificou-se que 96% dos trabalhadores apresentaram baixo risco para desenvolverem doenças cardiovasculares nos próximos dez anos, e trabalhadores homens com idade >40 anos jornada de trabalho menor apresentam maiores chances de apresentar doença cardiovascular.
Descritores: Doenças Cardiovasculares; Fatores de Risco; Enfermagem em Saúde Comunitária; Enfermagem do Trabalho; Saúde do Trabalhador.

RESUMEN
Objetivo: evaluar el riesgo cardiovascular en trabajadores de enfermería de un hospital público. **Método:** estudio transversal, con 324 trabajadores de enfermería, utilizando un cuestionario compuesto por dos bloques de información. El primero abordó cuestiones relacionadas con las características sociodemográficas y laborales y de salud, y el segundo, el Puntaje de Riesgo de Framingham revisada (ERF), para estratificar el riesgo cardiovascular. Para evaluar el estrés psicosocial en el trabajo se utilizó la Escala Sueca de Demanda de Control Social. **Resultados:** factor de riesgo modificable más prevalente para ECV fue el perímetro de cintura (75,9%), seguido del sobrepeso (43,8%), obesidad (29,3%), consumo de alcohol (21,9%), colesterol unido a lipoproteínas de baja densidad (LDL) > 130 (20,7%) e Hipertensión Arterial Sistémica (20,4%). **Conclusión:** se encontró que el 96% de los trabajadores tenían bajo riesgo de desarrollar enfermedad cardiovascular en los próximos diez años, y los trabajadores de sexo masculino > 40 años con jornadas laborales más cortas tienen mayor probabilidad de tener enfermedad cardiovascular.
Descriptores: Enfermedades Cardiovasculares; Factores de Riesgo; Enfermería en Salud Comunitaria; Enfermería del Trabajo; Salud Laboral.

INTRODUCTION

Chronic non-communicable diseases (CNCDs) are currently the most common causes of morbidity and mortality worldwide, having become one of the greatest public health problems today. Estimates from the World Health Organization (WHO) indicate that more than 36 million people die annually, worldwide, as a result of CNCDs, which corresponds to approximately 63% of deaths worldwide[1].

As individuals age, CNCDs become one of the main causes of morbidity, disability and mortality worldwide, especially after 45 years of age. Furthermore, the declines related to aging are gradual and start from the age of 20, being more noticeable from the age of 40 and can directly impact the ability to work[2-3].

Among CNCDs, cardiovascular diseases (CVDs) are currently the leading cause of mortality in Brazil and worldwide. More recent data highlight abdominal obesity, determined by waist circumference, as a marker of cardiovascular disease risk that is independent of Body Mass Index[4].

Among health professionals, nurses stand out, as they represent the largest workforce in the health area, covering more than 1.8 million professionals in the category and, also, for carrying out a work permeated by situations that cause wear, stress and carelessness of themselves[5-6]. A study[7] carried out with health workers in a teaching hospital in the South of Brazil found that nursing is the professional category most affected by work-related illness, that most of the absences found at work referred to medical leaves and that CVDs corresponded to the fourth cause for these leaves.

Occupational diseases and the determinants of health problems in nursing workers are frequently studied, however, there is still a gap between the research results and the changes that could occur in the work environment of these professionals to reduce their vulnerability to physical and mental health.

Considering the above, the relevance of this study is justified, since the identification of risk factors for CVDs and the other data collected will allow the stratification and assessment of the cardiovascular risk of this population, as well as devising strategies for planning health care.

OBJECTIVE

To assess cardiovascular risk among nursing workers at a public hospital in Minas Gerais.

METHODS

Ethical aspects

The project was approved by the Research Ethics Committee, in accordance with Resolution 466/12 of the Ministry of Health. The questionnaires were applied to the nursing workers, who consented to participate in the study, after signing the Informed Consent Form.

Study design, site, and period

This is a quantitative, cross-sectional study guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) tool. Data collection was carried out from September 2017 to February 2018 in a public hospital in Minas Gerais.

Population and sample: inclusion and exclusion criteria

The study population consisted of 413 nursing workers from all sectors, of both sexes, working day and night shifts. Active workers with a permanent contract were included in the study. Exclusion criteria were: being on leave; presenting a health situation or condition that could bias the results, such as pregnancy, and pathologies such as cancer and hormonal disorders; and workers who were in the process of retirement or exoneration. A total of 413 workers were eligible and, of these, there were 89 losses, because 64 did not have updated laboratory data in the medical records of the Specialized Service in Safety Engineering and Occupational Medicine, 25 refused to participate in the study, ending up with 324 participants.

Study protocol

To carry out this study, two instruments were used. The first was developed by the researchers, covering sociodemographic, occupational, health-related variables, personal background and life habits, anthropometric variables, blood pressure (BP) measurement and laboratory information. To the first instrument, the already validated questionnaire *Brazil Criterion of Economic Classification* of the Brazilian Association of Research Companies (ABEP - *Associação Brasileira de Empresas de Pesquisa*), 2016 version, was attached[8].

The second was the Swedish Demand-Control-Support Questionnaire (DCSQ), which, after cultural adaptation and validation into Portuguese, was called the Job Stress Scale, abbreviated version[9]. It is an instrument made up of 17 questions grouped into three dimensions: five questions assess psychological demand, six assess control over the work process and social support. The answers are provided on Likert-type scales from 1 to 4 points and were self-reported by participants[9-10]. The DCSQ scores were obtained by adding the points assigned to each of the questions in each dimension. Subsequently, the calculation of the ratio between demand and control scores was performed, which generated a continuous variable, which was categorized based on distribution tertiles. Thus, work-related psychosocial stress assessed by the DCSQ was classified as low stress (scores ≤ 0.80), medium stress (between 0.81 and 1.09) and high stress (scores > 1.09). For the purpose of bivariate analyses, the variable work-related psychosocial stress was categorized into low stress and high stress.

Data collection was carried out every day of the week, during working hours, at times that best suited workers' availability. It was performed individually in a room or office within the institution, where the instruments were initially applied and, later, the anthropometric and BP measurements were performed. Participants were asked if they had a family history of CVD, in relation to the previous presence of dyslipidemia, hypertension, diabetes, atherosclerotic, coronary or cerebrovascular diseases and chronic kidney disease. Information regarding serum levels of total cholesterol, LDL-c and HDL-c were later collected from the medical records of the respective participants.

Socioeconomic and demographic variables, those related to work and those related to health and life habits were self-reported by participants. Smoking and alcohol consumption were categorized according to the indicators of the Surveillance System of Risk and Protection Factors for CNCDs, by Telephone Survey and the Brazilian National Health Survey (PNS - *Pesquisa Nacional de Saúde*) 2013[11-12].

The cutoff points adopted for the Body Mass Index (BMI) and for increased cardiovascular risk, according to waist circumference, are those recommended by the WHO[13]. Adult individuals with a BMI < 18.5 kg/m^2 are classified as underweight, with a BMI of 18.5 kg/m^2 to 24.9 kg/m^2, eutrophic, with a BMI of 25 kg/m^2 to 29.9 kg/m^2, overweight, with BMI from 30 kg/m^2 to 34.9 kg/m^2, obesity I, with BMI from 35 kg/m^2 to 39.9 kg/m^2, obesity II and with BMI greater than or equal to 40 kg/m^2, obesity III. Individuals with a waist circumference equal to or greater than 80 cm in women and equal to or greater than 94 cm in men were considered individuals with increased cardiovascular risk[13]. BP was checked using the auscultatory method[14], using a manual aneroid sphygmomanometer and stethoscope. Two measurements were taken, after five minutes of rest, in the sitting position, being measured in the right and left upper limbs (once in each limb), considering the mean of the measurements[14].

To stratify cardiovascular risk, the Revised Framingham Risk Score (FRS) was used, which estimates the risk for the development of CVDs in ten years. The predictors used were sex, age, high-density lipoprotein cholesterol (HDL-cholesterol), total cholesterol, treated and untreated systolic blood pressure (SBP), smoking and diabetes mellitus. Based on the score, the risk scores for CVDs are classified into: low cardiovascular risk, which is equivalent to < 10% in ten years; intermediate cardiovascular risk, which corresponds to ≥ 10% and ≤ 20% in ten years; high cardiovascular risk, which equates to > 20% in ten years[15]. For the purposes of the analyses, we chose to assess cardiovascular risk in two categories (low risk and intermediate/high risk), aiming at avoiding the loss of precision due to the low number of individuals distributed in the 3 categories and guaranteeing that the reference group (low risk) would be composed of individuals who, in fact, presented more favorable health conditions in relation to the others.

Analysis of results, and statistics

Data tabulation and cross-referencing were performed using the IBM SPSS program (Statistical Package for Social Sciences), version 22.0. Descriptive statistics were used through absolute (n) and relative (%) frequencies, as well as mean and standard deviation of the variables analyzed. Bivariate analyzes were performed, verifying the association between the independent variables and the outcome variable cardiovascular risk, dichotomized into two categories: low risk and moderate/high cardiovascular risk. To verify the association between the variables, Pearson's chi-square test or Fisher's exact test (when expected values were less than 5) and multivariate logistic regression were used, based on the Odds Ratio and respective 95% confidence intervals. In all analyses, the significance level adopted was 5% ($p < 0.05$).

Multivariate analyzes were performed using binary logistic regression, seeking to identify the association between employment and sociodemographic variables and cardiovascular risk. Variables that were associated with cardiovascular risk at a significance level lower than 0.20 were included in the multiple logistic model. The following sequence of adjustments was adopted: model 1: adjusted for age and sex; model 2: model 1 + adjustment for other labor variables.

RESULTS

The sample consisted of a female profile (81.5%), mean age of 40.1 years (SD: ± 8.7), married (59%), with children (70.1%), self-reported white color or race (49.1%) and economic class B2 (44.1%) (Table 1). Regarding work activity, 78.7% were nursing technicians/assistants and 21.3% were nurses, performing their work activities during the day shift (59%), a 40-hour working hours a week, with an average working time of 8.4 years (± 6.6), with no other employment relationship (66%). As for psychosocial stress, 34.2% of workers had a low level of stress, 30.9% had a medium level and 34.9% had a high level (Table 1).

Table 1 – Socioeconomic, demographic and employment characteristics of nursing workers, Juiz de For a, Minas Gerais, Brazil, 2017-2018 (N=324)

Characteristics studied	n	%	Mean (standard deviation)
Mean age			40.1 (± 8.7)
Sex			
Male	60	18.5	
Female	264	81.5	
Age			
25 to 40 years	185	57.1	
41 to 55 years	115	25.5	
>55 years	24	7.4	
Marital status			
Married	191	59	
Single	92	28.4	
Separated/divorced	35	10.7	
Widowed	6	1.9	
Skin color			
White	159	49.1	
Black	82	25.3	
Brown	75	23.1	
Yellow	8	2.5	
Presence of child			
Yes	227	70.1	
No	97	29.9	
Economic class			
A[‡]	37	11.4	
B1[§]	62	19.1	
B2[‖]	143	44.1	
C1[¶]	69	21.3	
C2[**]	13	4.1	
Working time at the institution (years)			8.4 (6.6)
Position or role			
Nurses	69	21.3	
Nursing technicians/assistants	255	78.7	
Work shift			
Day	191	59.0	
Night	133	41.0	
Working hours			
Up to 30 hours	121	37.3	
40 hours	203	62.7	
Working time at the institution			
Less than 10 years	255	78.7	
10 to 20 years	41	12.7	
20 years and more	28	8.6	
Number of employment relationships			
1 job	214	66.0	
2 jobs	106	32.7	
3 and more	4	1.3	
Work-related psychosocial stress			
Low	111	34.2	
Medium	100	30.9	
High	113	34.9	

[‡]A = 45-100 (pontos); [§]B1 = 38-44; [‖]B2 = 29-37; [¶]C1 = 23-28; [**]C2 = 17-22.

Table 2 – Association between socioeconomic and demographic variables and cardiovascular risk among nursing workers, Juiz de Fora, Minas Gerais, Brazil, 2017-2018 (N=324)

| Variables | Cardiovascular risk | | | | P |
| | Low | | Moderate/high | | |
	n	%	n	%	
Sex					0.006
Female	263	95.8	11	4.2	
Male	61	86.7	08	13.3	
Age					<0.0001
Up to 39 years	182	98.9	02	1.1	
40 years and older	142	88.7	17	11.3	
Marital status					0.923
Married	190	94.2	11	5.8	
Not married	134	94.0	08	6.0	
Skin color					0.749
White	159	93.7	10	5.8	
Non-white	165	94.5	09	6.0	
Presence of children					0.383
Yes	222	93.4	15	6.6	
No	102	95.9	04	4.1	
Economic class					0.345
A[‡]	45	94.6	02	5.4	
B1/B2[§]	195	95.1	10	4.9	
C1/C2[‖]	84	91.5	07	8.5	

p - chi-square test; [‡] A = 45-100 (points); [§] B1/B2 = 38-44; [‖] C1/C2 = 23-28.

Table 3 – Association between work variables and cardiovascular risk among nursing workers, Juiz de For a, Minas Gerais, Brazil, 2017-2018 (N=324)

| Characteristics studied | Cardiovascular risk | | | | p |
| | Low | | Moderate/high | | |
	Number	%	Number	%	
Position or role					
Nurses	78	98.6	01	1.4	0.079
Nursing technicians/assistants	246	92.9	18	7.1	
Work shift					
Day	192	95.3	09	4.7	0.290
Night	132	92.5	10	7.5	
Working hours					
Up to 39 hours	118	89.3	13	10.7	0.004
40 hours or more	206	97.0	10	8.8	
Working time at the institution					
Up to 6 years	212	95.7	09	4.3	0.094
7 years and more	112	91.2	10	8.8	
Number of employment relationships					
1 job	213	94.9	11	5.1	0.439
2 or more	111	92.7	08	7.3	
Work-related psychosocial stress					
Low	161	91.0	09	9.0	0.091
High	163	96.5	04	3.5	

p - chi-square test.

The most prevalent modifiable risk factor for CVDs was waist circumference (75.9%), followed by overweight (43.8%), obesity (29.3%), alcohol consumption (21.9%), low-density lipoprotein cholesterol (LDL) > 130 (20.7%) and hypertension (20.4%) (Figure 1). When calculating the BMI of this population, it was found that 43.8% were classified as overweight, 29.9% as obese and 26.3% as eutrophic. It was found that 96% of workers had low cardiovascular risk, while 4% had moderate/high risk for CVDs in the next ten years.

Regarding socioeconomic and demographic variables and demographics, only age and sex were significant for cardiovascular risk (CR) (p = 0.006 and p < 0.0001, respectively). It was possible to observe that men and workers aged 40 or over had moderate/high CR (p: 0.006 and p:<0.0001, respectively), as described in Table 2. It was also found that 13.3% of men and 4.2% of women had moderate/high CR.

The work variable, according to CR, which maintained a significant association was working hours (p = 0.004). Among workers working up to 39 hours per week, 10.7% had moderate/high CR. Those with weekly working hours equal to or greater than 40 hours accounted for 8.8%. Those with shorter working hours had a higher frequency (Table 3).

The variables that maintained an association with CR in the multivariate analysis were age, sex, working hours, working time at the institution and work-related psychosocial stress.

In the CR analysis, using the unadjusted Odds Ratio, variables age, sex and working hours were associated with CR (Table 4).

In the adjusted analyses, they remained statistically associated with the variables age (OR: 8.49; 95%CI: 1.81-39.74 and OR: 7.22; 95%CI: 1.40-37.28) and sex (OR: 1.54; 95%CI: 1.59-15.36 and OR: 4.93; 95%CI: 1.51-16.11). Adjusting for age and sex variables reduced the strength of association between these variables and CR. In the additional adjustment for the other variables, the strength of association decreased for the age variable and increased for the sex variable.

DISCUSSION

In this study, when stratifying the CR of the population studied, it was found that most participants (96%) had low CR. High proportions of low risk were found in studies[16] carried out with health professionals. The FRS adequately identifies high and low

Table 4 – Multivariate logistic regression model of factors associated with cardiovascular risk in nursing workers, Juiz de Fora, Minas Gerais, Brazil, 2017-2018 (N=324)

Variables	Unadjusted Odds Ratio	CI	Adjusted Odds Ratio Model 1	CI	Adjusted Odds Ratio Model 2	CI
Age						
Up to 39 years	1.0	2.47-48.41	1.0	1.81-39.74	1.0	1.40-37.28
40 years and older	10.99		8.49		7.22	
Sex						
Female	1.0	1.36-9.23	1.0	1.59-15.36	1.0	1.51-16.11
Male	3.54		1.54			
Working hours						
40 hours or more	1.0	1.46-10.69			1.0	0.69-8.51
Up to 39 hours	3.95				2.43	
Working time at the institution						
Up to 6 years	1.0	0.86-5.53			1.0	0.17-2.29
7 years and more	2.18				0.62	
Work-related psychosocial stress						
Low	1.0	0.11-1.22			1.0	0.22-2.79
High	0.37				0.78	

CI - Confidence interval; Model 1 adjusted for age and sex; Model 2 adjusted for the other variables.

risk individuals; however, a justification for the high prevalence of low risk is due to the fact that it is a young population and, consequently, is in the predicted low risk range in the short term, i.e., for a period of ten years[17]. It can be observed that the most prevalent modifiable risk factor for CR was waist circumference (75.9%), followed by overweight (43.8%) and obesity (29.3%). Studies[18-19] found a prevalence of overweight of 35.1% and obesity of 55.7%.

The sociodemographic variables age and gender showed statistical significance with CR, and the moderate/high CR was evidenced in the age group > 40 years and male. With regard to sex and age, they are widely known risk factors for CVDs. Furthermore, it is already established in the literature[1-2,17-19] that the incidence of cardiovascular events increases progressively with age and in males.

Working hours was significantly associated with CR, unlike in a study[20], in which working hours was negatively associated. This fact may occur due to low remuneration, in which professionals need to have double or triple working hours to have extra money, which, in the present study, corresponded to a percentage of 33.95%. However, long working hours can lead to inappropriate health behaviors, such as increased consumption of alcoholic beverages, smoking, reduced hours of leisure, rest, physical activity and interference in sleep quality. Moreover, they are associated with a set of symptoms and diseases, such as stress, fatigue, musculoskeletal problems, gastrointestinal disorders, hypertension and depression[21-23].

The work characteristics of the population studied revealed that the nursing team is mostly made up of nursing assistants and technicians (78.7%), with a 40-hour working hour in the day and night shifts. These results confirm the profession as an organization guided by the technical and social division of work, with the hierarchy of the team in categories, in which nurses have predominantly administrative and supervisory functions for care activities, while direct care activities are largely performed by nursing technicians[24-25]. A study showed that shift work was associated with a higher prevalence of negative work-related factors, inappropriate habits and lifestyles, and changes in pressure during sleep[26].

Logistic regression analysis (Table 4) showed that men aged >40 years and working fewer hours were more likely to develop CVD. This fact can be explained by the fact that 34% of workers have more than one employment relationship, are young people with children, need to supplement their family income, with no time to take care of their health. A study[27] carried out with different groups of workers corroborates these results, in which there was a positive correlation between age, SBP and the influence of long working hours on coronary disease, hypertension, metabolic syndrome, in addition to sleep disorders, states of depression and anxiety. Studies[25,28] that analyzed the variables salary range, workload and number of employment relationships showed that the work overload experienced by nursing workers, due to low pay, they are forced to have more than one job and take little care of their health.

This study is similar to others[27,29-30], reinforcing the female profile of the Brazilian nursing workforce, young adults married with children. A previous study[31] showed that the largest contingent

of these professionals are in the age group of 26-45 years (67.3%), represented by nurses (63.7%) and nursing assistants and technicians (49.9%) who graduated ten years ago or less. In another research, it was evidenced that nursing professionals opt for the night shift, due to the additional payment for the shift, and for facilitating the fulfillment of domestic and daily life tasks, since most of them are made up of women, responsible, on a large scale, in addition to work, for domestic activities and family care[25].

As for work-related psychosocial stress, 34.9% of participants in this study had a high level of psychosocial stress. Studies[32-34] have shown, in the occupational environment of nursing, that the demands are high, especially in those who develop their activities in the hospital environment, as they often experience stressful situations, such as pain, suffering, death, intense work rhythms, long hours, shift work, low pay, shortage of human and material resources, in addition to other factors that can trigger and/or potentiate work stress. Linked to this fact, researchers[32-33] have shown that occupational stress, when continuous, can be harmful to workers' mental and physical health, and can lead to the development of CVDs, diabetes, sleep disorder, metabolic syndrome, Burnout syndrome, depression, use of psychoactive substances, in addition to a decline in productivity, absenteeism, job dissatisfaction and poor quality of life. Still corroborating this evidence, a similar research[34] in which participants had the same productive age profile, which is possibly linked to work overload, evidenced symptoms of stress and habits of daily living related to CR factors. Thus, excess activities and pressure at work can be stress triggers, as well as stress and sedentary lifestyle can be related to CVDs[35]. Still on the same subject, researchers[36] from Venezuela showed a high prevalence of Burnout syndrome, in which emotional exhaustion affected 75.5% of participants and that 37.5% had low personal fulfillment.

Study limitations

The first one refers to the fact that this is a cross-sectional study and does not allow establishing a temporal relationship between exposure and outcome. The bias of the "healthy worker effect", a phenomenon observed in studies in the area of worker health, cannot be disregarded in this type of study, since workers generally exhibit lower morbidity and mortality rates, when compared with the general population, since workers in worse health conditions would not be performing their work activities and, consequently, would not have been included in the eligible group of this study. In order to minimize this bias, workers were given two opportunities to participate in the study, if they were not present on the scheduled date, they would have another opportunity.

Contributions to nursing

Considering the number of cases of sick leave due to CVDs in nursing, studies that provide a situational diagnosis of workers' vulnerabilities are important to support prevention strategies. It is important that these findings also encourage the incorporation of healthy habits in the population studied, especially to contribute to improving nursing workers' quality of life.

CONCLUSION

The investigation made it possible to stratify the CR of the population studied and to show that most workers had a low risk of developing CVDs in the next ten years. The sociodemographic variables age and sex showed statistical significance with CR, and moderate/high CR was evidenced in the age group > 40 years and in males.

The results presented can support health promotion actions, prevention strategies and control of risk factors for CVDs, allowing a reflection regarding the levels of physical activity, stress and other variables studied and CR.

SUPPLEMENTARY MATERIAL

This manuscript is the result of a master's thesis entitled "*Risco cardiovascular em profissionais de enfermagem de um hospital público em Minas Gerais*" and is available at: https://repositorio.ufjf.br/jspui/handle/ufjf/8266.

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